

**TÜRKİYE'S CONTRIBUTION TO THE PROCESS IN FIGHTING CLIMATE CHANGE
WITHIN THE FRAMEWORK OF TURKISH ENVIRONMENTAL LEGISLATION¹****Assoc. Prof. Salih ÇİFTÇİ (Ph.D.)*** **Asst. Prof. Mesut KAYAER (Ph.D.)**** **ABSTRACT**

In this study, Türkiye's effectiveness in the process of fighting climate change was investigated. Firstly, environmental management and environmental legislation were analyzed within the framework of climate change. Türkiye, which is aware of climate change and its negative impacts, continues its active struggle. For this, Türkiye has reorganized its own environmental management and environmental legislation through legal and administrative regulations according to the conventions and protocol to which it is a party. Then, the greenhouse gas emission inventory, which is the main cause of climate change, was analyzed. When Türkiye's emission values are analyzed, it is understood that values are far from the declared commitments.

Keywords: Environmental Law and Management, Climate Change, Greenhouse Gas Emission.

JEL Codes: F64, K32, O13, O44, Q54, Q56.

1. INTRODUCTION

Humanity Mankind has experienced great problems and faced crises throughout history. Nowadays, the most significant challenge of humanity is global warming and climate change. The various human activities especially the economic ones are the main reason of this challenge. The world population has doubled in the last century and it has currently exceeded 8 billion. Based on projections, it is expected to exceed 10 billion by 2050. As a result, the current energy demand will inevitably increase and more emissions will be emitted. Thus, natural resource cycles in production and consumption processes are disrupted as a result.

Climate change poses direct or indirect threats to all environmental elements, including forests, water areas, ecosystems and biodiversity. Therefore, if human beings want to establish a sustainable world and future, should be able to demonstrate their volition to fighting against climate change together.

¹ Extended summary of this study, was presented as an oral presentation at the Online International Conference on Applied Economy and Finance (e-ICOAEF IX) held on 10-11 December 2022.

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Makale Geçmiři/Article History

Başvuru Tarihi / Date of Application : 1 Mart / March 2023

Düzeltilme Tarihi / Revision Date : 8 Haziran / June 2024

Kabul Tarihi / Acceptance Date : 26 Haziran / June 2024

Emission values exceeding thresholds due to the effect of population growth make it difficult to fight climate change.

Türkiye is located in the Mediterranean Basin, where is one of the regions that will be most negatively affected by climate change. Therefore, it is one of the most fragile country against climate change. For this reason, it has arrangements in its domestic law appropriate with the targets of international conventions and protocols on global warming. A modern environmental management has been established and international collaborations have been improved for a proactive struggle in this regard. In the management of this problem, compliance has been achieved within the framework of innovative approaches.

In this study, which is an important and effective actor in the fighting against climate change, Türkiye's contribution and actions will be evaluated. The conventions and protocols to which it is a party will be mentioned and the adequacy of its domestic law in this field will be discussed. The environmental management structure will be revealed by researching the Ministry of Environment, Urbanization and Climate Change and institutions affiliated to the ministry. The effectiveness of the units, which authorized and in charge of climate change, especially the Directorate of Climate Change will be analyzed. In this context, works toward to reduce carbon emissions and their results will be discussed.

2. INTERNATIONAL CONVENTIONS RELATED ON CLIMATE CHANGE AND TÜRKİYE

Türkiye has shown its willpower on this issue by being a party to the main conventions and protocols signed in fighting climate change. Some of these conventions and protocols are listed below:

The 1976 meeting of the United Nations Environment Program (UNEP), in which the problems related to the ozone layer were discussed, became an important threshold. In the next duration, it has been seen that the gases that cause the depletion of the ozone layer should be reduced. In this context, The Vienna Convention for the Protection of the Ozone Layer was signed in 1985. The Convention provides for cooperation in areas such as ozone layer research, systematic monitoring, limitation of chlorofluorocarbon (CFC) production and information sharing. Therefore, the parties have the function of taking precautions against human-induced activities that pose a threat to the ozone layer. Türkiye became a party to this convention in 1990 (The Vienna Convention, 1985).

After the Vienna Convention, numerous meetings were held and decisions were taken in this field. The discovery of the ozone hole over Antarctica in 1985 highlighted the urgency of the situation and accelerated the processes related to the protocol. The Montreal Protocol on Substances that Deplete the Ozone Layer, which is a continuation of The Vienna Convention, was adopted in September 1987. The Protocol was designed to limitation of chlorofluorocarbon (CFC) production and import. Türkiye, having adopted all amendments to the protocol in December 1991, is one of the most successful countries in the implementation of the protocol (The Montreal Protocol, 1987).

1992 United Nations Framework Convention on Climate Change's (UNFCCC), the ultimate objective is "... *the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system...*" (art. 2). So within the scope of the convention, the meetings were held at later dates and decisions were taken (United Nations, 1992: 4). Türkiye has become a party to this main agreement on climate change in 2004.

The Kyoto Protocol, one of the very first and most important action in fighting against climate change, adopted in 1997 and entered into force in 2005. The Kyoto Protocol, which is the first convention to set an emission reduction target, differs from other environmental conventions in terms of flexible mechanisms and possible sanctions to achieve the determined targets (The Kyoto Protocol, 1997).

The Protocol sets targets for limiting the emission of greenhouse gases such as CO₂, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. Although the Protocol (art. 12) prioritizes the use of green technologies, the overall use of fossil-based resources has not been reduced. There has been an increase in the use of green energy sources such as solar and wind, but the pace of transformation has not reached the desired level. The failure to write a success story can be explained by the selfishness of human beings who have the capacity to solve a global problem.

The Paris Agreement, based on the UNFCCC, was signed to regulate the post-2020 climate change regime, in 2015. That means, the targets of post- Kyoto's. The agreement determined to strengthen the socioeconomic and environmental resilience at the global level. In this framework, main goal is keeping the global temperature raise below 2 °C compared to the pre-industrial period. It is clear that in order to exceed this target, it is necessary to gradually reduce the use of fossil fuels (oil, coal, etc.) and turned towards renewable energy. Therefore, establishing and maintaining international cooperation is essential. The countries have the highest share in global emissions, especially USA and China, have to become parties to this convention and support their reduction projections (The Paris Agreement, 2015). Türkiye announced its 2053 net zero emission target and signed the agreement in 2016. After that, ratified the agreement and became a party to the agreement, in 2021 (Algedik et al., 2016).

Türkiye has shown its willpower on this issue by being a party to the main conventions and protocols signed in fighting climate change. Some of these conventions and protocols that Turkey has not ratified or has made reservations are as follows (International Agreements and Contracts, 2024):

- The Convention on the Conservation of Antarctic Marine Living Resources
- Convention For The Conservation Of Antarctic Seals

- The Aarhus Convention and Introduction to the Kyiv Protocol on Pollutant Release and Transfer Registers
- United Nations Economic Commission for Europe-The Convention on the Transboundary Effects of Industrial Accidents
- *Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) and Protocol on Strategic Environmental Assessment*
- Minamata Convention on Mercury
- *Offshore Protocol and Integrated Coastal Area Management Protocol to The Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention)*
- *Protocol on Further Reduction of Sulphur Emissions, Protocol concerning the Control of Emissions of Nitrogen Oxides, Protocol concerning the Control of Emissions of Volatile Organic Compounds, Protocol on Further Reduction of Sulphur Emissions, Protocol on Heavy Metals, Protocol on Persistent Organic Pollutants and The Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to The Convention on Long-Range Transboundary Air Pollution*

2.1. Turkish Environmental Legislation

Türkiye is aware of environmental problems that are the problems of humanity. So, Türkiye has always taken action for the environmental problems at the national and international level. In this context, in the 1982 Constitution, issues that especially the environmental right (art. 56), the property right (art. 35), the protection of the land (art. 44), housing right (art. 57), the protection of nature and cultural assets (art. 63), the protection of forests (art. 169) are regulated. Therefore, it can be said that there are many environmental regulations in Türkiye (Kayaer, 2012: 224-227). In 1983, the Environmental Law No. 2872 was enacted. Legal infrastructure and administrative structures have been established on environmental problems and management.

In this framework, Republic of Türkiye's Constitution has many subjects related to the environment, especially environmental right (art 56). “*Everyone has the right to live in a healthy, balanced environment. It is the duty of the State and the citizens to improve the natural environment, and to prevent environmental pollution.*”

In 1983, the Environmental Law No. 2872 was enacted, legal infrastructure and administrative structures have been established on environmental problems and management (art 1). “*To ensure that the environment, which is the common property of all living things, is protected in line with the principles of sustainable environment and sustainable development.*”

Environmental legislation in Türkiye is generally related to environmental organization. The provisions in various laws on environmental legislation, which had been implemented by different ministries and organizations in relation to their own fields of interest until the 1970s, were gathered under a single law with the Environmental Law No. 2872 enacted in 1983. One year later, in 1984, the General Directorate of Environment was established as a legal entity with an annexed budget under the Prime Ministry. This General Directorate was made responsible for implementing the Environmental Law (Our History, 2024). Therefore, a hierarchical organization within a bureaucratic structure was established for the implementation of environmental legislation and environmental inspection after 1983. In this period, the Environmental Law No. 2872 was considered sufficient in protecting the environment and preventing pollution. However, after 1997, new developments were observed in environmental legislation in Türkiye. In March 1998, a document entitled 'European Strategy for Turkey' was announced to improve relations. On November 4, 1998, the first "Progress Report", which would be published every year thereafter, was published and Türkiye was granted candidate status at the Helsinki European Council Summit on December 11-12, 1999. With this development, Türkiye started to implement important regulations in its environmental legislation that can be considered in line with the Amsterdam Treaty, which was signed by the European Union member states in 1997 and entered into force in 1999. Environmental policies in line with the sustainable development approach emphasized in the agreement were given importance (Erdem ve Yenilmez, 2017: 108).

In addition to these two important regulations, many legislations related to environment and climate change have been signed (Regulations, 2022); (Circulars, 2022); (Communiqués, 2022):

- The Halon Circular was published within the framework of the Montreal Protocol (2007).
- The Climate Change and Air Management Coordination Board Circular was published in order to regulate the working procedures and principles of the board (2013).
- The Regulation on the Monitoring of Greenhouse Gas Emissions was put into effect in order to regulate the procedures, principles regarding the monitoring of greenhouse gas (GHG) emissions arising from the aforementioned activities (2014).
- The Regulation on Substances that Deplete the Ozone Layer was put into effect in order to determine the procedures, principles regarding the use and termination of substances controlled by the Montreal Protocol, which Türkiye is a party (2017).
- In 2021, in order to regulate the procedures, principles regarding the monitoring and reporting of GHG emissions data, Communiqué on Monitoring and Reporting of Greenhouse Gas Emissions was published.
- Turkish Environment Agency Law was published in 2021, with the aim of establishing the Turkish Environment Agency in order to prevent environmental pollution, protect green areas,

increase resource efficiency in line with the zero waste approach, and carry out activities for the operation of the national deposit management system (Republic of Türkiye Official Journal, 2020).

- Establishment Decree of the Ministry of Environment, Urbanisation and Climate Change and Directorate of Climate Change was published in 2021 to change the name of the Ministry to Ministry of Environment, Urbanization and Climate Change and to establish Directorate of Climate Change affiliated to the ministry (Our History, 2024).
- Climate Change Expertise Regulation was published in 2022, to train experts in the field of climate change.
- National Climate Change Action Plan of Türkiye (2011-2023) and National Climate Change Strategy for Türkiye's vision took effect in 2010. It is defined as Türkiye's climate change policies fully integrating to all activities and actively participating in the efforts for tackling climate change. The strategic targets and basic principles of this plan are in line with the agreements to which Türkiye is a party. According to the plan; to contribute to the global GHG emission mitigation policies, to integrate policies and measures for mitigating and adapting to climate change into national development plans and to avoid the adverse impacts of global climate change are main targets (NCCAP, 2012; NCCASAP, 2012).

2.2. History of Environmental Management in Türkiye

Briefly looking at history of environmental management in Türkiye, the first use of the name environment was with the establishment of the Coordination Committee for Environmental Problems in 1973. One year later, the name of the Committee was changed to Environmental Coordination Committee. In 1978, the Prime Ministry Environment Organization was established in order to determine the basic policies for protection of the environment. In order to implement the environmental law (1983), a General Directorate of Environment affiliated to the Prime Ministry, was established and then it was transformed into an undersecretariat. In 1989, the Special Environmental Protection Agency for Special Areas was established (Our History, 2024).

The Ministry of Environment, Urbanization and Climate Change was established at the ministerial level as the Ministry of Environment in 1991 and renamed as the Ministry of Environment and Forestry in 2003. In 2011, the Ministry changed its name again to the Ministry of Environment and Urbanization, and finally took its final form as the Ministry of Environment, Urbanization and Climate Change with the addition of the term climate change as of 2021 (Our History, 2024).

While the organizational chart of the Ministry is researched, it will be seen that there are many units which direct or indirect authority and task definitions related to climate change (Organization Chart, 2022):

- Türkiye has added climate change to the name of the ministry and has established The Directorate of Climate Change within the Ministry to show the importance for fighting against climate change. This department is responsible for determining policies, strategies and actions and conducting negotiation processes within the scope of fighting and adapting for climate change. Another duty of this department is raising of climate change awareness.
- The Department of Climate and Agricultural Meteorology which works under The Turkish State Meteorological Service has many duties directly related to climate change. Such as making climate change models; monitoring, researching and reporting on climate change; creating climate change projections and investigating the negative effects of climate change on human, plant and animal health.
- In addition, there is a Climate and Climate Change Branch Directorate which works under this Department. This directorate is also directly tasked with climate change issues like adaptation and mitigation against the adverse effects of climate change.
- General Directorate for Protection of Natural Assets is directly responsible for climate change and effects which has a Department of Conservation, Monitoring and Special Environmental Protection Areas and International Projects and Fighting Climate Change Branch Directorate affiliated to this department. The responsibility of this department are; to identify the climate change's effects on natural resources in protected areas, to prepare climate change action plans, to identify the effects of climate change and to carry out rehabilitations to monitor GHG emissions that cause climate change and to take necessary measures.
- The Department of Zero Waste Practices, which works under the General Directorate of Environmental Management, is involved in fighting against climate change, although indirectly in terms of waste management.
- The Air Management Department has the task of protecting air quality, controlling emissions and determining targets, principles, policies and strategies.
- The Department of Fighting Desertification is responsible for fighting desertification and adaptation to climate change.
- The Erosion Control Department, has duties on climate change in addition to its main duties.
- The Environmental Protection Directorate, which is affiliated to the Turkish Environment Agency, carries out activities related to the improvement of the environment and responsible to contribute conservation and sustainability of green areas.
- The Department of Climate Finance and Incentives carries out tasks such as climate-friendly investment, climate finance and fighting climate change.

- The Department of Climate Negotiations and International Policies) has duties to follow and coordinate international negotiation processes and within the scope of international organizations and international conventions.
- Department of Carbon Pricing has the task of carrying out studies on the emission trading system and work intended for economic instruments. Also carbon offsetting is another important duty of this department.
- The task of preparing legislation and guidelines for the determination, monitoring and evaluation of climate change adaptation policies has been given to the The Department of Climate Change Adaptation and Local Policies.
- The Department of Greenhouse Gas Reduction Policies has duties to manage processes and prepare a Long-Term Climate Strategy within the framework of the net-zero emission target and circular economy.
- The Department of Monitoring of Greenhouse Gas Emissions is responsible for taking measures regarding GHG emissions that cause climate change and the protection of the ozone layer. It is also responsible for processes related to the Montreal Protocol.

Türkiye continues its struggle against climate change together with all institutions and organizations of the state, especially this ministry and its affiliates (Baykal Fide, 2022).

There are three important regulations regarding renewable energy in Türkiye. These are the Law No. 5686 on Geothermal Resources and Natural Mineral Waters, the Law No. 5346 on the Utilization of Renewable Energy Resources for Electricity Generation and the Electricity Market Law No. 6446. These laws set the framework for renewable energy legislation in Türkiye.

Law No. 5686 was enacted to "regulate the procedures and principles regarding the effective exploration, research, development, production, protection of geothermal and natural mineral water resources and the ownership and transfer of rights on these resources as well as their economic utilization in harmony with the environment" (art. 1).

The purpose of Law No. 5346 (art. 1) is defined as 'expanding the use of renewable energy resources for electricity generation, bringing these resources into the economy in a reliable, economical and high quality manner, increasing resource diversity, reducing greenhouse gas emissions, utilizing waste, protecting the environment and developing the manufacturing sector needed to realize these objectives'.

The purpose of Law No. 6446 (art. 1) is stated as 'the establishment of a financially strong, stable and transparent electric energy market operating under the provisions of private law in a competitive environment in order to provide electricity to consumers in a sufficient, high quality, continuous, low

cost and environmentally friendly manner, and to ensure independent regulation and control in this market'.

In addition to these laws, there is a Presidential Decree called 'Renewable Energy Legislation' as well as 19 regulations and 3 communiqués All these regulations cover wind and solar energy and waste management (Renewable Energy Legislation, 2024).

3. REASONS OF CLIMATE CHANGE AND METHODS OF FIGHTING AGAINST CLIMATE CHANGE

Today, climate change studies is an interdisciplinary subject that is increasingly important in both natural and social sciences. Climate; It is a complex and interactive system that is also affected by the content of the atmosphere, land cover, water, forest and living organisms. As a result of fossil fuel use and human activities leading land cover change, the rate of carbon dioxide (CO₂), the most important greenhouse gas, is increasing rapidly and the components of the atmosphere are changing (IPCC, 2007a: 5).

UNFCCC, defines climate change as “*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods*” (United Nations, 1992: 3). Intergovernmental Panel on Climate Change (IPCC) refers to the definition as “*a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity*” (2007a: 30).

Climate change can cause disruptions in ecology and ecosystem cycles, and irreversible damage to nature. Ecosystem, is a region that specific and recognizable landscape forms like deserts, wetlands, grasslands, forests and coastal areas. Ecosystem is controlled by climatic conditions such as temperature, the amount of sunlight and precipitation in the region. Ecology, is the study of how organisms interact with each other and their physical environment. Ecological factors are divided into two: biotic and abiotic. Climate, one of the abiotic factors, has a significant environmental impact on ecosystems. Changing climatic conditions affect ecosystems in various ways. For example, warming may cause some species to migrate to higher latitudes or higher places, as it directly affects their temperature-dependent living conditions. Similarly, rising sea levels can cause saltwater to mix into the freshwater system and cause the displacement or death of some important species (EPA, 2010: 2). Climate change not only directly affects ecosystems and species, but also affects societies and their settlements. For example, rising sea levels can destroy coastal settlements. In addition, the rising of heavy rains and storms causes the land to become vulnerable to erosion. All these factors directly affect humanity and create negative pressures on human life.

These adverse situations force people to relocate and cause them to become climate refugees. When the migration mobility data prepared by the Internal Displacement Monitoring Center (IDCM) are examined, disasters such as floods, droughts, forest fires, storms, landslides caused by climate change have displaced a large number of people. In 2022, 31.9 million people from 146 countries had to migrate (IDCM, 2024). In fact, according to the 2050 projection, approximately 1 billion people will become climate refugees (Nordhaus, 2020: 122). Therefore, it can be said that one of the problems in the future will be climate refugees.

3.1. Reasons of Climate Change

Climatic warming or cooling is due to changes in energy flow through the climate system. Therefore, these changes throughout history and climate change in particular, new problems. When the geological data are examined, it has been determined that "natural causes" lead to climate change. Today, earth's temperature has doubled compared to 50 years ago. However, this rapid increase could not be due to natural causes, but human activities contributed to this increase (AAS, 2018). "Natural causes" still exist today, although their effects are minor and occur too slowly to explain the rapid warming seen in recent years (NASA, 2010). In this context, the reasons for climate change can be divided into natural causes and human-induced activities.

Changes in sunlight, dust clouds and meteorites in the universe, Earth's movements around its axis and the sun, volcanic activities due to substances emitted into the atmosphere, temperature changes in the ocean, chemical changes in the atmosphere and the movement of continents constitute the natural causes of climate change (Ersoy, 2006: 5-13). Huber and Knutti (2012: 34), conducted a study to reveal that mankind is the dominant reason of the observed warming in the last 150 years, especially in the last 50 years. They concluded that at least 74% of the warming observed since 1950 is due to human activities.

Humanity has seriously affected the climate with the industrial revolution. Since then, the average world temperature has increased by about 0.8 °C. The sea level has risen by about twenty cm and most glaciers have shrunk. As technology develops and industrialization increases, greenhouse gas emissions have also increased. About 60% more has been added to the existing greenhouse gases, and this increase has triggered climate change. In this context, the causes of high emissions leading to climate change can be sorted accordingly; greenhouse gas emissions, fossil fuel use, black carbon, industrial production, agriculture, deforestation, urbanization and population growth (European Commission, 2018).

3.2. Methods of Fight Against Climate Change

Climate change is an intricate issue that including complex interactions between environmental, climatic, political, institutional, economic, social and technological development processes. Hence, just like in sustainable development, these processes cannot be considered separately. That's why, there are

differences in the analysis of climate change and its effects (IPCC, 2001: 75-110). The process analyzes in the fighting against climate change are associated with more practical development, equality and sustainability issues. From this perspective, this attribution reveals the processes of determining policies and strategies aiming to minimize climate change and its effects.

In general, the stages of fighting climate change can be listed as; “*detection of problems and impacts*”, “*identification of vulnerabilities of systems*”, “*development of national and international policies*”, “*determining adaptation strategies in direction with the identified vulnerabilities*” and “*realization of mitigation policies*”. In this context, the processes of fighting climate change can be grouped under “*mitigation*” and “*adaptation*” (IPCC, 2001: 77-100). All these processes are both separate and interdependent.

In the fighting against climate change, the identification of vulnerabilities is of great importance in terms of policies and strategies to be developed against the climate change, especially in the adaptation process of the fight. In this process, actions can be carried out to determine the adaptation capacities of the systems exposed to change by revealing the vulnerabilities. Nevertheless, the point that should be addressed is that although the identification of vulnerabilities is included in the adaptation process, the mitigation process is also important as an input to vulnerability studies.

The first of the methods in the fighting against climate change is the mitigation process. Mitigation is defined as reducing anthropogenic greenhouse gas emissions to minimize the effects of climate change and stabilizing the emissions in the future. Mitigation means requires joint action on a global scale to minimize greenhouse gas emissions. In this context, in the mitigation process, which includes issues such as establishing policies and putting them into action through various mechanisms (emission trade, developing of new and clean technologies, exchanging of information and technology, etc.); the issues of “*cost effective*”, “*sustainable development and equality*”, “*global sustainability and social learning*” are important (Füssel ve Klein, 2006: 304).

Another method of fighting climate change is the adaptation process. In the definition of the term “*adaptation*”, first of all, the state of adaptation, the system that adapts and forms of adaptation should be revealed. Adaptation is generally divided into autonomous/spontaneous adaptation and planned adaptation. Autonomous/spontaneous adaptation refers to “*a process of adaptation that occurs spontaneously, especially after the effects of an uncontrollable situation*”. Planned adaptation expresses “*the processes carried out to reduce the effects and control the situation by making predictions about a certain situation*”. In addition to the classification according to the purpose, it is also divided according to period as short, medium and long term. It is also possible to classify according to local, regional and national scales, and by sectors such as energy, transportation, agriculture. Finally, it is also classified according to who or what adapts (Smit, Burton, Klein, Wandel, 2000: 242-244).

Designing a system that is resilient to disasters and building resilient cities requires taking precautions in advance and being ready for the problems caused by climate change. Thus, it will be possible to overcome disasters, especially droughts, fires and floods, with less damage. Climate change has devastating consequences on the whole ecosystem. Sustaining the ecological balance necessitates management processes and decisions compatible with climate change. Resilient urban planning including before and after the crises will give the opportunity to minimize the risks brought by climate change (Türkeş, 2022: 198; Talu, 2015: 36).

4. TÜRKİYE'S FIGHT AGAINST CLIMATE CHANGE

As a result of human activities, especially the use of fossil fuels, the components of the atmosphere are rapidly changing due to the increase in CO₂, the most important greenhouse gas. The amount of CO₂, which is estimated to have been between 275-285 ppm² before the industrialization, has increased by approximately 100 ppm for 250 years and has increased up to 400 ppm today. Due to this change, it has been determined that there has been a 0.2 °C increase in average temperatures since 1990 (IPCC, 2007b).

According to researches; if the current situation continues, it is expected that the CO₂ concentration in the atmosphere will reach 415-480 ppm by 2050 and 460-560 ppm by 2100. It is predicted that the global temperature rise will be between 1.5-4.5 °C from the 1990 reference period until 2050 (IPCC, 2007a). IPCC, states that between 1990 and 2090, the global sea level will rise by 0.09-0.37 m depending on the temperature rise (IPCC, 2001).

The Conference of the Parties is held every year within the framework of the UNFCCC, which came into force in 1994 after the Rio Conference (1992). At the 21st conference held in Paris in 2015, it was determined as the main objective to keep global warming below 2 °C compared to the pre-industrial period. At the Paris Conference, more than 150 countries submitted a statement called "Intended Nationally Determined Contributions (INDC)". According to the declaration; at the end of this century, it is predicted that the 2 °C target for global warming will not be reached and the temperature rise will be realized as 2.7 °C. It is estimated that the temperature rise due to global warming will exceed 4 °C, if the commitments in the declarations are not realized and current environmental policies continue to be implemented (INDCs, 2015).

Considering the commitments of the countries that ratified the Paris Agreement, it is clear that the commitments made will make our world warmer. Therefore, it can be said that the target given by Türkiye in its declaration of contribution is not sufficient and that it will not even achieve the emission reduction rates with its commitment. If Türkiye, which is one of the 20 countries emitting the highest

² ppm (parts per million): **means one parts per million**. 1 part per million of the total amount in any mixture is called 1 ppm. It is known as the concentration unit. It can also mean one millionth of anything.

amount of greenhouse gases, does not stay on a realistic emission path like other countries, it will not be possible to reduce the average surface temperature increase to the desired level (TÜSİAD, 2020).

The Paris Agreement, which entered into force in 2016, has been an important threshold in the fighting against climate change. Türkiye has accepted the Paris Agreement, provided that the demand for access to financial and technology supports in the new climate regime is compensate. Türkiye, has committed reducing the increase in emissions, not reducing its emissions, in its statement on fossil fuel combustion. Türkiye, aims to decrease its GHG emissions by approximately 21% by 2030. Thus, commits to reduce it to 929 million tons of CO₂ equivalent (CO₂ emt) instead of 1.175 CO₂ emt (INDCs, 2015).

In doing so, Türkiye makes a strong commitment to reduce greenhouse gas emissions. However, its will to realize these commitments cannot be demonstrated because of economic development and lack of resources. Argentina and Brazil, which are considered in the same status as Türkiye, aim to reduce their emissions below 2005 levels by 2030. Mexico, on the other hand, aims to reduce its emissions after reaching its highest emission level in 2026. The European Union plans to reduce greenhouse gas emissions by 55% by 2030. The 2050 target is 'carbon neutrality'. Similarly, China aims to be carbon neutral by 2060. Japan, South Korea and Canada also have zero emission plans. As of the end of 2020s, many countries have framed their 'carbon neutrality' targets and plans within the national legal order. However, Türkiye's official plans do not include a realistic target to reduce greenhouse gas emissions for the post-2030 period (The Climate Action Tracker, 2023; ECIU, 2024).

As a country that aims to integrate sustainable development and climate change policies and increase energy efficiency in the NCCASAP, which came into effect within this framework, aimed to offer low carbon intensity to all its citizens. While making arrangements the NCCAP, objectives were determined on the basis of sectors in order to reduce Türkiye's vulnerability to climate change. It has been demonstrated that the vulnerability to climate change would be reduced by implementing and maintaining the objectives within the given timeframes.

In the action plan, priority sectors and areas have been determined within the framework of Türkiye's sustainable development principles and environmental protection thought and policies have been developed for these areas. Türkiye has accepted commitments at the international level in the fighting against climate change. In this context, in line with the current and possible climate change's effects on Türkiye, policies have been developed for the industry, transportation, energy, buildings, land use, waste, agriculture and forestry sectors and fields (NCCAP, 2012: 11-13).

The Climate Change Action Plan, includes total of 49 goals, 107 targets and 541 actions. Unlike the National Climate Change Strategy Document, the NCCAP has not set any numerical emission reduction targets in goals, targets and actions (NCCAP, 2012: 9-18).

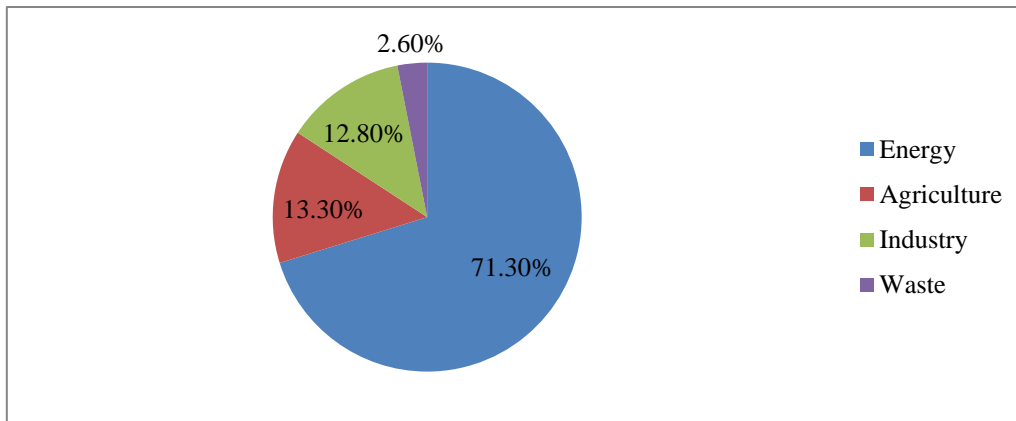
While all countries are planning for carbon neutrality and decarbonization targets, Türkiye's distance from this approach raises questions about the future. The fact that the 2030 target is set as a reduction in the rate of increase instead of emission reduction shows this issue. Türkiye, which is responsible for around 1% of total greenhouse gas emissions, does not have a rational decarbonization target for 2050. In fact, if the process continues as it is, it will not be possible to approach the net zero decarbonization target by 2050, as stated in the Türkiye's Decarbonization Roadmap report (Friedrich et al., 2023).

Türkiye needs to take responsibility with realistic targets and contribute to the fight against climate change. It should integrate itself into a carbon-neutral world order by developing policies in line with the principles of sustainability rather than warming-causing approaches. According to projections, the Mediterranean Basin is the region that will be most affected by climate change-induced problems, particularly drought. Türkiye, which is located in this geography, will definitely experience serious negative consequences of the inconsistency in its targets for reducing greenhouse gas emissions that cause global warming. For this reason, Türkiye should prioritize its carbon neutral policies as soon as possible.

5. GREENHOUSE GAS EMISSIONS AND TÜRKİYE'S EMISSION INVENTORY

Since global warming and climate change are, largely, caused by GHG emissions, countries are explicitly requested in the UNFCCC to limit their GHG emissions. According to the convention, it is aimed to diminish GHG emissions to 1990 levels. The organizing of the UNFCCC was put forward at the "The Second World Climate Change" conference held in Switzerland in 1990. At this conference, a meeting was planned in Brazil in 1992 and thus the first step towards UNFCCC was taken (United Nations, 1990: 15). For this reason, the year 1990 was taken as a reference, examining the GHG emission inventories of the countries. In this context, examining Türkiye's emission inventory, the latest emission data and 1990 data were evaluated comparatively.

Figure 1. GHG Emission Rates by Sector



Reference: TURKSTAT, <https://data.tuik.gov.tr/>, Greenhouse Gas Emissions Statistics, 19.04.2024.

In Türkiye, the largest share in total GHG emissions, in 2021, is energy-based emissions with 71.3%, as CO₂ emt. This was followed, in order, by agriculture with 13.3%, industry with 12.8% and waste with 2.6%. According to the GHG inventory; total GHG emissions in 2021 increased by 7.7% compared to the previous year and were measured as 564.4 CO₂ emt. The GHG emissions per capita were calculated as 4 CO₂ emt in 1990, 6.3 CO₂ emt in 2020 and 6.7 CO₂ emt in 2021.

Table 1. GHG Emissions by Sectors 1990-2021 (CO₂ emt)

Year	Total	Energy	Industry	Agriculture	Waste
1990	219,5	139,5	22,9	46,1	11,1
2019	508,7	365,6	59,0	68,0	16,1
2020	524,0	366,6	68,0	73,2	16,3
2021	564,4	402,5	75,1	72,1	14,7

Reference: TURKSTAT, <https://data.tuik.gov.tr/>, Greenhouse Gas Emissions Statistics, 19.04.2024.

Energy sector emissions swelled by 9.8% in 2021 compared to the last year and were measured as 402.5 CO₂ emt. Industry emissions increased by 10.6% to 75.1 CO₂ emt, agricultural emissions increased by -1.5% to 72.1 CO₂ emt and waste emissions increased by -9.9% to 14.7 CO₂ emt.

According to Table 1; it is understood that Türkiye's emission values are above the 1990 emissions taken as reference. It is clearly observed that the emission rates have increased over the years. It is understood that emission values decreased only in 2018 and 2019 compared to the last year. In this period, there was a partial decrease in emissions due to the impact of the covid-19 pandemic.

Table 2. GHG Emissions 1990-2021 (CO₂ emt)

Year	Total	CO ₂	CH ₄	N ₂ O	F-gases
1990	219,5	151,6	42,5	25,0	0,5
2019	508,7	402,7	63,2	37,0	5,8
2020	524,0	412,9	63,9	40,5	6,7
2021	564,4	452,7	64,0	40,3	7,4

Reference: TURKSTAT, <https://data.tuik.gov.tr/>, Greenhouse Gas Emissions Statistics, 19.04.2024.

Analyzing Türkiye's greenhouse gas emissions by gas types in 2021, it will be seen that the largest share of CO₂ emissions with 85.2% is in the energy sector. 32.7% of this emission rate is due to electricity and heat generation. CO₂ emissions were calculated as 14.5% in the industry sector and 0.3% in the agriculture and waste sectors. CH₄ emissions were caused by 61.4% of agriculture, 19.3% of waste, 19.3% of energy and 0.03% of industry sectors. As for N₂O emissions; 78% based on agriculture, 11.1% based on energy, 5.9% based on waste and 5% based on industry.

According to Table 2, showing the greenhouse gas emission values of Türkiye; it is observed that CO₂, methane, nitrogen and fluorinated gases are constantly increasing. Therefore, the rate of change in

CO₂ emissions between 1990 and 2021 has increased by 198.6%. The rate of change between 2020-2021 has increased by 9.6%. The rate of change in CH₄ emissions between 1990 and 2021 was 50.7%, and the increase in the rate of change compared to the previous year was calculated as 0.2%. Between 1990 and 2021, the rate of change in N₂O emissions was 61.5%, with an increase of -0.5% compared to the last year. The emission rate of fluorinated gases is; it has been calculated as an increase of 1456.8 percent between 1990 and 2021. The rate of change of fluorinated gases compared to one year ago was 10.2%.

Table 3. Türkiye's Emissions Inventory (1990-2021)

	1990	2019	2020	2021	1990-2021 Change (%)	2020-2021 Change (%)
Total Emission	219,5	508,7	523,9	564,4	157,1	7,7
Energy	139,5	365,6	366,6	402,5	188,4	9,8
Industry	22,9	59,0	68,0	75,1	228,7	10,6
Agriculture	46,1	68,0	73,2	72,1	56,5	-1,5
Waste	11,1	16,1	16,3	14,7	32,6	-9,9

Reference: TURKSTAT, <https://data.tuik.gov.tr/>, Greenhouse Gas Emissions Statistics, 19.04.2024.

The year 1990 is taken as a basis for the measurement of greenhouse gas emission rates. Countries report their greenhouse gas emission inventories every two years. Türkiye announced its latest greenhouse gas emission rates in 2021. According to the rates announced in 2021; Türkiye's total emission rate, which was 523.9 CO₂ emt in 2020, was realized as 564.4 CO₂ emt in 2021. This means an increase of 7.7% compared to the last year. The rate of change between 1990 and 2021 was 157.1%. In the energy sector, the highest emission is experienced, the rate was calculated as 402,5 CO₂ emt. The rate of change in the energy sector between 1990 and 2021 was 188.4%. However, the rate of change compared to the previous year was calculated as 9.8%. Between 1990 and 2021, the most change occurred in the industry sector. The rate of change was 228.7%. Compared to the last year, the rate of change was again the sector with the highest increase in this sector and the change was calculated as 10.6%. The amount of emissions in agriculture; calculated as 72.1 CO₂ emt and the rate of change between 1990 and 2021 was measured as 56.5%. The rate of change compared to the last year was -1.5%. The amount of emissions in the waste sector was 14.7 CO₂ emt. The rate of change was 32.6% compared to the value in 1990, and it was -9.9% compared to 2020. Total greenhouse gas emissions per capita were 4 CO₂ emt in 1990, 6.3 CO₂ emt in 2020 and 6.7 CO₂ emt in 2021.

Based on the data on Türkiye's emission inventory in the fighting against climate change; it is observed that there is a continuous increase in greenhouse gas emission rates. In order for Türkiye to reach its 2030 targets in the fighting against climate change, needs to reduce its emissions by at least 35%. The rate of 35% means that Türkiye needs to reduce its emissions by the level of 340 CO₂ emt

from the level of 523.9 CO₂ emt in 2020. In this sense, the emission inventory to be published in 2023, is important for Türkiye's 2030 emission targets.

The emission trend of EU Member States has shown a decline from 1990 to 2020. The 2030 and 2050 targets under the 2015 Paris Agreement are also in line with this downward trend. While the total emission for 1990 was over 1 billion CO₂ equivalent tons, a great success was achieved in 2010 and it reached an average level of 85.73 CO₂ emt. 2020 data points to levels below 80 CO₂ emt. The emissions of the USA, which was 5.68 billion CO₂ equivalent tons in 2010, decreased to 5.057 billion CO₂ equivalent tons in 2022. China's emissions increased from 8.621 billion CO₂ equivalent tons in 2010 to 11.397 billion CO₂ equivalent tons in 2022. India is also one of the countries whose emissions increased from 1.677 billion CO₂ equivalent tons in 2010 to 2.83 billion CO₂ equivalent tons in 2022. Japan, on the other hand, was able to reduce its 2010 emissions from 1.215 billion CO₂ equivalent tons to 1.054 billion CO₂ equivalent tons in 2022. According to these data, China, the US and India are responsible for more than 40% of global emissions (Statista, 2024).

6. CONCLUSION

Although climate change has occurred due to natural causes in the historical period, these problems have been repaired by the nature itself in a short time. However, recent human activities are causing the exacerbation of climate change, experiencing negativities and accelerating the extinction.

Our planet, which is rapidly warming with GHG emissions, may encounter irreversible situations by the end of this century. This possible risk and threat will not only cause crises at the local level. All nations will experience the climate change's negative effects in all areas, especially in socio-economic and socio-cultural areas.

The climate change's effects shown transboundary characteristics. In order to minimize these negative effects, cooperation at global scale seems necessary. Many meetings were held and contracts were signed in the international arena for cooperation in this field. The most important texts signed on this field are the UNFCCC and Kyoto Protocol. However, these conventions, which do not have a strict sanction mechanism to achieve the desired result, have not been binding for the parties. This situation has led countries to create a text with their own commitments and declarations on GHG emissions. In this context, the Paris Agreement, on the contrary the previous two agreements, has been accepted as being binding at the global level. Thus, the parties will be able to take low-carbon and sustainable actions by reducing their GHG emissions.

Türkiye has participated in international processes in the fighting against climate change, has become a party to the relevant conventions and protocols. Türkiye, seeing climate change and the global threats thereof, has rearranged, environmental management and environmental legislation. As well as its legal and administrative innovations, Türkiye has actively participated in the fighting against climate

change and supported global actions with its environmental policies. However, although Türkiye carries out an emission reduction policy, it does not seem possible to say that it plans an emission limitation method compatible with the fighting against climate change.

Türkiye, as a developing country, wants to benefit from the same mechanisms as the countries in the same category in terms of emission reduction and capacity building. While carrying out emission reduction actions in the fighting against climate change, it carries out efforts to reach the targeted values. It has to carry out at a certain level of economic activity in order to make economic balance, social welfare sustainable. In this sense, Türkiye is trying to reduce its emission rates in a controlled manner. Türkiye is experiencing a dilemma at the point of protecting its socio-economic structure and realizing its sustainable development goals.

In Turkish Intended Nationally Determined Contribution, it has been calculated that the total GHG emissions will increase to 1.17 billion tonnes by 2030. Türkiye has announced its target of reducing it to 929 CO₂ emt by making a 21 percent reduction. However, according to the report 'Türkiye's Decarbonisation Roadmap: Net Zero in 2050' which published by Sabancı University Istanbul Policy Center (IPC); if no measures are taken, Türkiye's total CO₂ emissions will increase by 66 percent in 2050 compared to 2018 and reach 700 CO₂ emt. It is stated in the report that Türkiye's total GHG emissions will be 890 CO₂ emt in 2050 (Şahin et al., 2021: 6-9).

According to TURKSTAT data; total GHG emission per capita in Türkiye in 2020 is 6.3 tonnes. Thus, carbon emissions per capita in Türkiye were realized as 4.97 tonnes. However, the world average of carbon emissions per capita is 4.47 tonnes. Therefore, the emission rate in Türkiye is above the world average. Within the framework of the world's 4 degree warming path, it can be said that Türkiye remains within the practices aimed at warming the planet, considering the commitments of the countries for 1.5 degrees determined to the Paris Agreement. Türkiye ratified the Paris Agreement, also announced its '2053 net zero' targets. Despite this, it cannot be said that climate policies and practices are compatible and assertive in this direction.

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Hakem Değerlendirmesi: Dış bağımsız.

Çıkar Çatışması: Yazar çıkar çatışması bildirmemiştir.

Finansal Destek: Yazar bu çalışma için finansal destek almadığını beyan etmiştir.

Teşekkür: -

Peer-review: Externally peer-reviewed.

Conflict of Interest: The author has no conflict of interest to declare.

Grant Support: The author declared that this study has received no financial support.

Acknowledgement: -